R E P O R T R E S U M E S

ED 010 851 24

A STUDY OF THE EFFECTS OF AWARENESS ON CONCEPT FORMATION.

BY- LANYON, RICHARD I.
RUTGERS, THE STATE UNIV., NEW BRUNSWICK, N.J.

REPORT NUMBER CRP-S-439 PUB DATE 67
REPORT NUMBER BR-5-8430
EDRS PRICE MF-$0.09 HC-$1.68 42P.

DESCRIPTORS- *LEARNING PROCESSES, VERBAL ABILITY, VERBAL DEVELOPMENT, *INTELLIGENCE, MENTAL DEVELOPMENT, *PSYCHOLOGICAL PATTERNS, *CONCEPT FORMATION, *VERBAL LEARNING, COGNITIVE PROCESSES, NEW BRUNSWICK

THE LEARNING OF VERBALLY CONDITIONED MATERIAL WAS STUDIED TO CLARIFY SOME OF THE CONDITIONS UNDER WHICH SUCH LEARNING IS ACCOMPANIED BY THE USE OF HIGHER MENTAL PROCESSES, AND THE CONDITIONS UNDER WHICH IT IS NOT. THE STARTING POINT FOR THIS RESEARCH WAS THE PREMISE THAT LEARNING IN VERBAL CONDITIONING CAN OCCUR EITHER WITH OR WITHOUT AWARENESS ON THE PART OF THE LEARNER. TO CLARIFY SOME OF THE CONDITIONS UNDER WHICH LEARNING OF VERBALLY CONDITIONED MATERIAL IS ACCOMPANIED BY THE USE OF HIGHER MENTAL PROCESSES OR NOT, THE INVESTIGATOR STUDIED THE EFFECTS OF TWO SUBJECT VARIABLES, INTELLIGENCE AND PSYCHOLOGICAL SET, AND THREE TASK VARIABLES. HE CONCLUDED THAT LEARNING CAN TAKE PLACE IN SUBJECTS OF AVERAGE INTELLIGENCE, OR BELOW, IN VERBAL CONDITIONING WITHOUT AN ACCOMPANYING AWARENESS ON THE PART OF THE LEARNER. IN ADDITION, LEARNING WITHOUT AWARENESS IN VERBAL CONDITIONING CAN ALSO TAKE PLACE IF THE SUBJECTS DO NOT HAVE A PSYCHOLOGICAL SET. FINALLY, HE CONCLUDED THAT THE FORMATION OF AWARENESS WHILE LEARNING IS RELATED TO SEVERAL ASPECTS OF THE LEARNING TASK. (GD)

ED010851

N&A

A STUDY OF THE EFFECTS OF AWARENESS ON CONCEPT FORMATION

Cooperative Research Small Contract
Project No. S-439
BUREAU NO. 5-8430

Richard I. Lanyon
Rutgers University
New Brunswick, N. J.

1965-1967

The research reported herein was supported by the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

TABLE OF CONTENTS

Problem on Which the Research Was Founded	1
Related Research	1
Objectives	2
Hypotheses and Procedures	4
A. Subject type	4
B. Response Class Complexity	4
Procedure	6
Results	6
Discussion	7
Conclusions and Implications	8
References	10
Footnotes	11
Appendix I: Word Groups Used in Concept Formation Tasks	12
Appendix II: Verbal Conditioning: Intelligence and Reported Awareness	
Appendix III: Verbal Conditioning: Awareness and Subject Set	

Problem on Which the Research Was Founded

The nature of the learning process is one of the most important topics for present-day educational and psychological research. Much of the basic knowledge which we possess on this very broad topic has been derived from research with lower animals. While it may be possible that at least some of this basic knowledge is also relevant to human learning, there exists a wide area of human learning not amenable to elucidation through animal research. The area referred to is learning which is mediated by conscious verbal processes.

Very young children, not yet possessing verbal skills, cannot make use of these distinctly human processes in learning. It has been assumed by some researchers that older children, and adults, habitually use such processes in most of their verbal and concept learning.

Recently, evidence has been presented (e.g., Postman and Sassenrath, 1961; Verplanck, 1962) to suggest that the learning of verbal materials might take place, under some circumstances, without the conscious mediation of symbolic processes; that is, without the learner being "aware" that the learning is taking place. Some of this evidence comes from studies in verbal operant conditioning. Although many of these verbal conditioning studies have been oriented primarily toward the topic of psychotherapy, the research findings to date offer fruitful opportunities for adding to our knowledge of how verbal materials are learned. The present investigation takes, as its point of departure, an extensive literature survey of previously reported verbal conditioning studies. The present studies are designed to clarify some of the conditions under which the learning of verbally conditioned material is accompanied by the use of higher mental processes, and the conditions under which it is not.

Related Research

The topic of verbal conditioning has been of widespread interest in the last ten years, as a technique for investigating verbal social interactions, and also for investigating verbal learning and concept formation processes. However, several reviewers (Krasner, 1958; Krasner, 1962; Salzinger, 1959; Greenspoon, 1962), in describing work in the field, have reported little closure on many of the basic issues.

One area of particular disagreement is the importance to learning of the subjects' awareness of the response-reinforcement contingency, defined in terms of a verbal report elicited during or after the experiment. Thus, in the opinions of Spielberger (1962, 1965) and Dulany (1961, 1962), awareness plays a crucial part in the verbal conditioning process. On the other hand, to Postman (Postman and Sassenrath, 1961), a verbalized report of awareness is simply an alternative measure of response strength. In Verplanck's (1962) opinion, an awareness report is best viewed as an operant response which can be manipulated like any other operant. Krasner (1962), while considering awareness an important variable in the interaction process,

regards awareness defined in terms of subjects' self-reports as a "concept of dubious validity." Farber (1963) considers that "the only important question is whether, by defining awareness in a given way...one can better account for the variations in the subjects' behavior."

As Farber implies, it is not very useful to ask whether awareness is important to learning. Rather, the appropriate question to ask, first, is about the experimental situations in which awareness reports accompany learning. Having answered this question, the second logical procedure is to investigate these situations in their own right, in order to delineate the basic psychological variables which lead to awareness reports.

The first question, about the situations in which awareness reports accompany learning, was approached empirically by the present author. All available published verbal conditioning studies were examined, and those with clearly reported findings (133 of them) were classified according to a large number of variables, including occurrence of learning and reports of awareness (Lanyon, 1966a). Preliminary examination of the data indicated that three of these variables in particular might be related to learning and awareness. Accordingly, their relationships were examined in detail. Chi-square tests revealed that they varied with awareness and learning in the following manner:

Subject type. For nonstudent subjects, awareness reports accompanied learning relatively less often than for student subjects.

Response class complexity. Awareness reports accompanied learning relatively more often with simply defined, highly reliable response-classes (e.g., first-person pronouns; plural nouns), than with response-classes defined by judges' ratings or complex rules (e.g., emotional words; mildly hostile vs. intensely hostile verbs).

Response choice limitation. Contrary to prior expectation, awareness reports did not accompany learning any more often in structured (multiple-choice) tasks, where subjects' freedom to response was limited, than in unstructured tasks, where subjects had an unlimited response choice. (e.g., interview situations.)

To see whether the two significant situational conditions were directly related to amount of learning, studies reporting a failure of any group to learn were noted. Failure to learn was related to neither condition, allowing the tentative conclusion that the relationships between awareness reports and the situational conditions were not simply due to variation in degree of learning.

Objectives

A distillation of the verbal conditioning research literature has suggested two conditions (independent variables) which appear related to frequency of awareness reports. In the present study, it is intended to

investigate the psychological variables underlying these conditions. On the basis of the findings of the 133 studies referred to above, hypotheses are advanced, for each of the conditions, as to what facilitates awareness.

Subject type. There are several possible differences between college students and non-college Ss to account for the relationship with awareness. One is the presumed intelligence discrepancy or, more specifically, the discrepancy in verbal ability. Indirect support for this hypothesis was provided in a study by McCullough (1962), in which high intelligent patients produced positive awareness reports after verbal conditioning more often than low intelligent patients, with no difference in the amount of learning manifested by the two groups. Crowne and Strickland (1961) also found that degree of learning in verbal conditioning was unrelated to intelligence.

Another possible factor differentiating college and non-college Ss is the psychological "set" with which they approach the verbal conditioning task. Their expectations of the situation and their need to understand the proceedings have presumably been quite different. College students, who have typically been "signed up" from introductory psychology classes, are likely to approach a verbal conditioning situation with a strong need to understand the nature of the experiment. They might be considered to possess a set toward "learning about psychology," leading them to engage in cognitive activity and to test hypotheses about the nature of the situation (cf. Dulany, 1961). On the other hand, non-college groups and students with no experience in psychology have less reason for being interested in the underlying purpose of the study, and might therefore be expected to treat the situation in a less questioning manner. The effect of a psychological set would presumably be enhanced by performing the experiment under "psychological" conditions; that is, in an experimental room in a psychology building, with other psychological apparatus in evidence.

Response class complexity. There are at least three possible factors in the relationship of response class complexity to the reporting of awareness. (a) It is suggested that response classes defined by complex rules are not so readily conceptualized as those defined by simple rules. As an example, in studies where the reinforced class was intensely hostile verbs, the remainder of the stimuli presented being mildly hostile verbs, intensity of hostile connotation has usually needed to be determined in advance by judges' agreement (e.g., Binder, McConnell, and Sjoholm, 1957; Buss and Durkee, 1958). By contrast, the tense of a verb, whether past, present, or future, is unambiguous (e.g., Binder and Salop, 1961). Thus, the concept "intensity of hostile connotation" should be a more difficult concept to attain than "verb tense." (b) Further, it is considered that response classes defined by complex but reliable rules are more readily conceptualized than response classes defined by complex and unreliable rules. Thus, intensely hostile verbs should be easier to conceptualize if the distinction has been previously agreed upon by six out of six judges, than if agreed upon by only four or five out of six judges. It is also

suggested that response classes with a small membership (e.g., prepositions) are more readily conceptualized than response classes with a large membership (e.g., past tense verbs).

Hypotheses and procedures

A. Subject type

Hypothesis I: High intelligent Ss, equated for degree of learning on a verbal conditioning task with low intelligent Ss, would report awareness of the response-reinforcement contingency more often than low intelligent Ss, independent of differences in learning.

Since this study has been already reported independently, (Lanyon and Drotar, 1966), it is presented as Appendix II of the present report. Briefly, it is noted that the results clearly confirmed the hypothesis.

Hypothesis II: College student Ss who have never taken a psychology course would show more learning without awareness than college students currently involved in a two semester introductory psychology sequence.

This study has been reported independently (Lanyon, 1966b) and is presented in Appendix III of the present report. Again, the results generally confirmed the hypothesis.

B. Response class complexity

Hypothesis III: Response classes defined by simple rules are more readily conceptualized than those defined by complex rules.

Hypothesis IV: Response classes with a small membership are more readily conceptualized than those with a large membership.

Hypothesis V: Response classes defined by complex but reliable rules are more readily conceptualized than those defined by complex and unreliable rules.

Hypotheses III, IV, and V were investigated in a single study. The method was to have Ss watch as E presented, one at a time, a set of index cards, each containing a single word. A total of four such sets were shown. Subjects were informed that each set of cards contained two different kinds of words (i.e., two response classes). After the presentation Ss were asked to make their best guess as to what were the two kinds of words in each of the four sets. Thus, their ability to form the designed concepts was tested. To ensure that each concept was capable of being recognized, Ss were later informed of it and asked to sort the cards, using the correct concept. The word groups are presented in Appendix I.

Hypothesis III: Response classes defined by simple vs. complex rules.

The concept defined by simple rules was "verb tense: present vs. past." Forty-eight common verbs were selected. Twenty-four were randomly chosen to be presented in the past tense, and the remaining 24 were presented in the present tense (first person form). An important criterion in selecting the verbs was that most of them should not have past tenses ending in "...ed," to guard against the possibility of making the discrimination between present and past tense visually instead of conceptually. No verb was more than five letters in length. The mean length of the present tense verbs was 4.2 letters; of the past tense, 4.3. Attention was paid to matching mean lengths in this manner to guard against making the discrimination on the basis of length.

The concept defined by complex rules was "verb hostility: hostile vs. neutral." A list of 341 verbs was presented to 30 judges with instructions to judge them intensely hostile, mildly hostile, or not hostile. From the judgments, 24 verbs were selected as hostile and 24 as neutral. The hostile verbs had been rated by all raters as hostile (either IH or MH). The neutral verbs had been rated by all raters as not hostile. The mean length of the hostile verbs was 5.9 letters; the neutral verbs, 6.1 letters. All verbs were in the first person form of the present tense.

The hypothesis predicted that a higher proportion of Ss would successfully form the past vs. present concept while observing the cards than the hostile vs. neutral concept.

Hypothesis IV: Response classes with a small vs. a large membership.

The concept with a small class membership was "grammatical function: pronouns vs. prepositions." Twenty-four words of each type were selected. The mean length of the pronouns was 4.1 letters; the prepositions, 3.8 letters. Of each word type, 22 were in the first 500 of the Thorndike-Lorge frequency of usage list, and the remaining two appeared in the 510-1000 category. It should be noted that 24 words constitute the majority of the class membership in each case.

The concept with a large class membership was "verb tense: present vs. past," as described above.

The hypothesis predicted that a higher proportion of Ss would successfully form the pronouns vs. prepositions concept while observing the cards than the past vs. present concept.

Hypothesis V: Response classes defined by complex reliable rules vs. complex unreliable rules.

The concept defined by complex and reliable rules was "verb hostility: hostile vs. neutral," as described above.

The concept defined by complex and unreliable rules was "degree of verb hostility: intensely vs. mildly hostile." From the above mentioned judgments of 341 verbs, 24 verbs were selected as intensely hostile (IH),

and 24 as mildly hostile (MH). The IH verbs had been rated by all or nearly all raters (lowest = 67%) as IH, and by none or few of the raters (highest = 24%) as MH. The MH verbs had been rated by all or nearly all raters (lowest = 73%) as MH, and by none or few of the raters (highest = 24%) as IH. The mean length of the IH verbs was 6.5 letters; of the MH verbs, 6.3 letters. All verbs were in the first person form of the present tense. The 48 cards were shuffled and presented as a single deck.

The hypothesis predicted that a higher proportion of Ss would successfully form the hostile vs. neutral concept while observing the cards than the IH vs. MH concept.

In designing the above three hypotheses, an attempt was made to avoid confounding of the variables. Thus, the particular concepts whose formation was compared in testing hypothesis III, simple vs. complex rules, were equivalent or comparable with respect to the characteristics compared in the other two hypotheses, namely, size of class membership and response class reliability. Similar considerations applied to hypotheses IV and V.

Procedure

Subjects were 96 introductory psychology students, who participated in order to fulfill a course requirement. Each S sat facing E^1 across a table in a small bare experimental room. All sets of 48 cards were randomized before each presentation. The E produced the first set of 48 cards, and said:

> "Here is a set of cards. Each card has a single word on it, and in the set there are two different kinds of words. I'm going to show you the cards one by one, and when I'm through, I want you to tell me what the two different kinds of words were."

The E showed the cards at one-second intervals. At the end he recorded S's response concerning the two kinds of words.

Each of the four sets of 48 cards was shown in this manner. The order of presentation of the sets was randomized. The second, third, and fourth sets were prefixed with: "Now here is another set..."

After all four sets had been shown, E informed S of the two kinds of words in each case. He then requested S to attempt to sort each set of cards into two piles according to the correct criterion. The accuracy of each sorting was checked and recorded by E.

Results

The responses made by Ss to the four "criterion questions" were recorded by E verbatim, and were later designated by him as correct or incorrect. A second judge independently judged the answers as correct or incorrect. The judges disagreed only twice, and these disagreements were resolved by discussion. Neither judge was aware of the hypotheses being tested.

The number of Ss who correctly stated each concept (out of a possible 96), and the mean number of words sorted correctly (out of a possible 48) were as follows:

Verb tense (present vs. past):	31	correct concepts	48.0	mean correct sorting
Degree of verb hostility (intensely vs. mildly hostile)	46	"	40.7	"
Verb hostility (hostile vs. neutral):	69	"	47.4	"
Grammatical function (personal pronouns vs. prepositions):	88	"	48.0	"

Hypothesis III. The proportion of students correctly forming the verb tense concept was significantly lower than the proportion correctly forming the verb hostility concept ($\underline{X}^2 = 31.3$, $\underline{p} < .001$). This result was contrary to expectation.

Hypothesis IV. The proportion of students correctly forming the grammatical function concept was significantly greater than the proportion forming the verb tense concept ($\underline{X}^2 = 71.8$, $\underline{p} < .001$). Hypothesis IV was thus supported.

Hypothesis V. The proportion of students correctly forming the verb hostility concept was significantly greater than the proportion correctly forming the degree of verb hostility concept ($\underline{X}^2 = 11.5$, $\underline{p} < .001$). Hypothesis V was thus supported.

Discussion

Hypotheses IV and V were clearly upheld; hypothesis III was not. Some insight into this failure might be gained if the results are examined in a somewhat different manner. An intuitive comprehensive examination of the three hypotheses can be made by categorizing the four concepts in the following manner:

Verb tense	simple, large membership, reliable
Degree of verb hostility	complex, large membership, unreliable
Verb hostility	complex, large membership, reliable
Grammatical function	simple, small membership, reliable

Each of the four concept formation proportions--31, 46, 69, and 88 respectively out of 96--differs from each of the others beyond the .05 level. Comparison of these data with the hypotheses suggests that it was the verb tense concept cards (past vs. present) which were generally at variance with expectations, and thus might be held responsible for the failure of hypothesis III.

If the results for the verb tense concept are questioned, hypothesis IV (small vs. large class membership) cannot be considered to have been put to an adequate test. However, further comparisons of small vs. large class membership can be made from the above classification. These comparisons (degree of verb hostility vs. grammatical function; verb hostility vs. grammatical function), though not unequivocal tests of the hypothesis, do support it.

That the verb tense concept should prove difficult to learn was not entirely unexpected. A previous study (Lanyon, 1966b, Experiment I) also found this concept to be particularly difficult to learn in a straightforward verbal conditioning situation. A possible explanation for these findings is that the small vs. large membership concept is of overriding importance in determining ease of concept formation. The verb classes are larger by far than any of the others, including the verb hostility classes which were used for comparison in hypothesis III. This possibility, that out of the factors studied in the present investigation, the major determinant of ease of concept formation is size of class membership, should receive further study.

Conclusions and Implications

The present program of research took as its starting point the view that learning in verbal conditioning can occur either with or without awareness on the part of the learner. Learning which is accompanied by awareness is considered to be closer in nature to an automatic conditioning process. A careful analysis of previous verbal conditioning studies suggested that certain circumstances favored the occurrence of one kind of learning, while different circumstances facilitated the other kind. The current project, with the ultimate interest of gaining a better understanding of the two kinds of learning, undertook an investigation of the particular conditions under which each might be expected ot occur. One likely set of differentiating conditions had to do with the kind of subjects and the way they approached the learning task; another with certain characteristics of the task itself.

The findings show that subjects will use verbal mediating processes in learning if they view the task as one in which such an approach is appropriate, or if they are well-practiced and competent in the use of verbal mediating processes. Though these conclusions should surprise nobody, they have implications for the broader field of the learning of verbal and conceptual material. One implication is that the use of mediating processes can be facilitated simply by making the subject aware that he should be using them.

One surprise is the lack of evidence that verbal conditioning is facilitated by the use of verbal mediating processes. Certainly it is not to be seriously considered that this could be true for learning in general. What is interesting is the suggestion that it is possible to learn a verbal concept <u>without</u> the use of mediating processes.

The conlusions concerning the task characteristics which facilitate concept formation are also entirely expected. If the concept has relatively few instances, and if it is reliable defined, it will be learned more easily. Whether or not simplicity of definition is related to ease of learning was not put to an adequate test. Probably the size of class membership (few vs. many instances) is the more significant variable, and this is intuitively reasonable. To be shown the majority of all existing instances of a conceptual class should result in a much greater likelihood of recognizing and labelling the class than if only a relatively small proportion of the class is shown.

It is possible that there are other variables which are associated with the use of verbal mediating processes in verbal conditioning. Those demonstrated in the present study might be summarized as follows: (a) S's verbal ability and facility with verbal mediating processes; (b) S's orientation toward the situation as a learning situation; (c) the clarity or precision of the concept; and (d) the proportion of the population of instances of the concept, rather than the number of instances, to which Ss are exposed.

References

Binder, A., McConnell, D., and Sjoholm, N. A. Verbal conditioning as a function of experimenter characteristics. J. abnorm. soc. Psychol., 1957, 55, 309-314.

Binder, A., and Salop, P. Reinforcement and personality factors in verbal conditioning. J. Psychol., 1961, 52, 379-402.

Buss, A. H., and Durkee, A. Conditioning of hostile verbalizations in a situation resembling a clinical interview. J. consult. Psychol., 1958, 22, 415-418.

Crowne, D. P., and Strickland, B. R. The conditioning of verbal behavior as a function of the need for social approval. Journal of Abnormal and Social Psychology, 1961, 63, 395-401.

Dulany, D. E., Jr. The place of hypotheses and intentions: an analysis of verbal control in verbal conditioning. In C. W. Eriksen, (Ed.), Behavior and awareness--a symposium of research and interpretation. J. Pers., 1962, 30, 102-109.

Dulany, D. E., Jr. Hypotheses and habits in verbal conditioning. J. abnorm. soc. Psychol., 1961, 63, 251-263.

Farber, I. E. The things people say to themselves. Amer. Psychologist, 1963, 18, 185-197.

Greenspoon, J. Verbal conditioning and clinical psychology. In A. J. Bachrach (Ed.) Experimental Foundations of Clinical Psychology. New York: Basic Books, 1962.

Kanfer, F. H., and McBrearty, J. F. Verbal conditioning: discrimination and awareness. J. Psychol., 1961, 52, 115-124.

Krasner, L. Studies of the conditioning of verbal behavior. Psychol. Bull., 1958, 55, 148-170.

Krasner, L. The therapist as a social reinforcement machine. In H. Strupp and L. Luborsky (Eds.), Research in Psychotherapy, Vol. II. Washington, D. C.: The American Psychological Association, 1962.

Lanyon, R. I. The importance of awareness reports in verbal operant conditioning. Unpublished manuscript, 1966. (a).

Lanyon, R. I. Verbal conditioning: awareness and subject set. Unpublished manuscript, 1966 (b)

Lanyon, R. I., and Drotar, D. Verbal conditioning: intelligence and reported awareness. Paper presented to the Eastern Psychological Association, New York, April, 1966.

McCullough, K. P. The influence of experimenter status upon verbal conditioning. Unpublished masters thesis, University of Iowa, 1962.

Postman, L., and Sassenrath, J. The automatic action of verbal rewards and punishments. J. gen. Psychol., 1961, 65, 109-136.

Salzinger, K. Experimental manipulation of verbal behavior: a review. J. gen. Psychol., 1959, 61, 65-95.

Spielberger, C. D. The role of awareness in verbal conditioning. In C. W. Eriksen (Ed.), Behavior and awareness-a symposium of research and interpretation. J. Pers., 1962, 30, 73-101.

Spielberger, C. D. Theoretical and epistemological issues in verbal conditioning. Reprint of a paper in S. Rosenberg (Ed.), Directions in Psycholinguistics, to be published by the Macmillan Co., 1965.

Taffel, C. Anxiety and the conditioning of neurotics. J. abnorm. soc. Psychol. 1955, 51, 496-501.

Verplanck, W. S. Unaware of where's awareness: Some verbal operants--notates, monents, and notants. In C. W. Eriksen (Ed), Behavior and awareness--a symposium of research and interpretation. J. Pers., 1962, 30, 139-158.

Footnote

1. My thanks are extended to Dennis Drotar for serving as the experimenter.

APPENDIX I

Word Groups Used in Concept Formation Tasks

Degree of Verb Hostility		Verb Hostility	
Mildly hostile	Intensely hostile	Hostile	Neutral
ridicule	enrage	trample	give
infect	suffocate	lynch	meet
embitter	stab	hate	refresh
debase	trample	murder	loan
hate	strangle	slay	repay
harass	crucify	hang	allow
inflict	slay	cripple	sketch
heckle	kill	inflame	apply
sting	rape	hack	delegate
provoke	loathe	rape	afford
quarrel	cripple	avenge	soften
hurt	molest	enrage	assist
bully	decapitate	agonize	walk
annoy	agonize	mutilate	guide
dishonor	electrocute	kill	accredit
damage	hack	scourge	create
frustrate	behead	stab	gladden
pester	lynch	abuse	nominate
irritate	annihilate	corrupt	install
scold	murder	assault	devote
scowl	hang	behead	contribute
anger	doom	crucify	acquire
rebuke	excruciate	afflict	purify
denounce	demolish	strangle	prepare

Verb Tense				Grammatical Function			
Present		Past		Prepositions		Pronouns	
grow	think	drove	tore	at	up	me	themselves
know	take	begun	built	to	by	my	yourself
speak	use	led	lit	off	on	we	herself
see	write	rose	lent	in	for	us	himself
live	make	wept	slew	from	into	he	itself
drink	swim	fed	rode	onto	near	it	myself
bring	ring	glued	broke	with	upon	one	their
give	have	slid	slept	over	down	you	them
meet	say	shook	flew	among	above	him	they
stand	fall	died	drank	before	along	his	your
send	fight	stole	were	after	under	she	mine
run	keep	went	tried	behind	beside	her	its

APPENDIX II

Verbal Conditioning: Intelligence and Reported Awareness

Richard I. Lanyon and Dennis Drotar

Rutgers University

Abstract

An extensive survey of previous verbal conditioning studies suggested that frequency of S awareness was related to intelligence. Twenty-two high intelligent and 22 low intelligent high school juniors and seniors were reinforced for choosing I-we responses in a common verbal conditioning task. Control Ss received the same amount of reinforcement randomly distributed. An exhaustive post-experimental discussion was held with each S to determine any awareness of the response-reinforcement contingency. While more high than low intelligent Ss reported awareness, aware and unaware Ss did not differ in degree of learning, which was significant for both groups. Degree of learning was unrelated to sex and intelligence. The results failed to support the utility of cognitive theory in understanding verbal conditioning phenomena.

The importance of Ss' verbal reports of awareness of the response-reinforcement contingency in verbal conditioning studies is an unresolved issue. Dulany (1961) and Spielberger (1962, in press) have suggested that the situation is best viewed cognitively. In this view, learning depends on mediating cognitive activity, which is directly reflected in Ss' replies to questions about his awareness of E's purpose. On the other hand, Farber (1963), Krasner and Ullmann (1963), and Southwell (1962) have supported the view that the utility and the correlates of awareness reports should be empirically determined for each particular set of experimental circumstances.

In accordance with the latter viewpoint, the senior author surveyed more than 200 verbal conditioning studies published between 1953 and 1963. Of those (131) studies where awareness was specifically considered as a variable, and where results were reported with adequate clarity, it was found that the degree of awareness reported was related to several independent variables, the most significant being the kind of Ss employed. College students systematically reported a higher degree of awareness than non-college Ss (patients, attendants, children, etc.), and there was some evidence that this finding was independent of the degree of learning achieved.

There are several possible differences between college and non-college Ss to account for this finding. One is the presumed intelligence discrepancy or, more specifically, the discrepancy in verbal ability. Indirect support for this hypothesis was provided in a study by McCullough (1962), in which high intelligent patients produced positive awareness reports after verbal conditioning more often than low intelligent patients, with no difference in the amount of learning manifested by the two groups. Crowne and Strickland (1961) also found that degree of learning in verbal conditioning was unrelated to intelligence. The present study directly tested the

hypothesis that high intelligent Ss, equated for degree of learning on a verbal conditioning task with low intelligent Ss, would report awareness of the response-reinforcement contingency more often than low intelligent Ss.

Method

Subjects. Seventy-four high school juniors and seniors aged 16 or 17 were given the Quick Test (QT). The QT, developed by Ammons and Ammons (1962), is an easily administered individual intelligence test said to measure verbal-perceptual intelligence. Reliability and validity are reported by Ammons and Ammons to be satisfactory. Ss consisted of high school students from the local community. Approximately equal numbers of males and females were tested. The 25 Ss at the high and the low end of the distribution were designated the high and low intelligence groups respectively, while Ss scoring in the middle intelligence range were used in a later control group. IQ scores for the high intelligence group ranged from 108 to 120, with a mean of 112. For the low intelligence group, the range was 87 to 98, with a mean of 95.[2] After discarding six Ss as a result of their performance during the first 20 trials (see below), each group contained 11 males and 11 females.

Procedure. The verbal conditioning task first reported by Taffel (1955) was used. Six pronouns (I, you, he, she, we, they) were typed in random order across the bottom of 140 3x5 inch index cards. In the middle of each card was typed a different past tense verb. Ss were run in random order at one of several locations outside the university. In each case, E sat facing S across a table in a room free from distraction. The conditioning task was conducted some days after the QT was administered. Although the same E administered the QT and conducted the conditioning task, the possibility of

differential treatment of the high and low intelligent Ss was effectively minimized by E's practicing his procedure with preliminary Ss until it was routinized and automatic.

The stimulus cards were randomized and placed in a stack on the table with a sample card on top. It was explained to S that he/she was to construct one sentence for each of the cards, beginning with any one of the pronouns, and using the verb. Ss were told that speed of construction was important. E wrote down some or all of each sentence as it was given, then signalled for the next card to be turned, allowing approximately equal time for each card. During the first 20 trials, in which the operant level of pronoun choices was established for each S, E reinforced S's 1st, 7th, and 14th sentences, regardless of the pronoun chosen. Such a procedure was necessary in order to avoid the "startle" reaction which Ss would often give to the first reinforcement if it was delayed until after the 20th trial. Reinforcement consisted of E's saying (randomly) either "good", "fine", "okay", or "mm-hmm" immediately after the sentence to be reinforced. For trials 21 through 80, E reinforced every sentence for which a first person pronoun (I or we) was chosen. The run was terminated after 80 trials. Six Ss who gave more than 14 or less than 3 first person pronouns during the first 20 trials were eliminated from the study.

Following the 80 trials, each S was asked a series of questions designed to elicit a report of awareness of the response-reinforcement contingency. If S had not verbalized the connection between his behavior and E's after the first four questions, which were the same as those used by Lanyon (1964) and others, E questioned informally at exhaustive length to try to elicit such a report. This discussion was modeled after Levin's (1961) interview schedule,

with E ultimately explaining in detail the exact nature of the study to S in order that there should be no doubt in S's mind as to what E wanted to know.

To investigate whether learning occurred, it was necessary to use one or more control groups who are given the same number of reinforcements as the experimental groups, but in random sequence. Planning the controls thus had to await analysis of the data from the experimental groups. Since the rate of I-we response production was not related to sex or intelligence, it was sufficient to use a single control group of mixed sex and intermediate intelligence. Each control S received the same number of reinforcements per block of 20 trials as the mean of the combined experimental groups, but randomly distributed (3, 8, 9, and 10 reinforcements respectively for the first, second, third, and fourth block of trials). The control Ss (Group C: N=20) consisted of 11 males and 9 females from the middle IQ range, 99-107.

Results

The change in I-we response production is first considered without regard for reported awareness. Figure 1 shows the mean number of I-we responses for each of the four blocks of 20 trials, in each of the four sex

Insert Figure 1 about here

by intelligence groups separately. A Type III analysis of variance (Lindquist, 1956, p. 281), summarized in Table 1, revealed no significant interactions among any of the three variables, and no significant differences between the responses of males and females, nor between high and low intelligent Ss. A

Insert Table 1 about here

significant effect for trials ($F = 7.84$, $df = 3/120$, $p < .01$) indicated that overall production of I-we responses differed from block to block, and a t-test

between the overall means for the first and last blocks showed a significant increase in I-we responses over the 80 trials ($t = 6.22$, $df = 42$, $p < .001$).[3] Separate t-tests for the high and low intelligent Ss were also conducted, using the standard error specific to the group. Both were significant (for the high intelligent Ss, $t = 2.38$, $df = 21$, $p < .05$; for the low intelligent Ss, $t = 2.89$, $df = 21$, $p < .01$), demonstrating unequivocally that both high and low intelligent Ss increased their I-we response production.

The data for awareness were next considered. Since no differences in I-we response production were found for either sex or intelligence level, the groups were combined over sex into composite groups of high intelligence (Group H) and low intelligence (Group L) Ss. Each S was then classified as aware or unaware according to the result of the post-experimental interview. Unequivocal classification was possible in all cases, with the extended questioning eliciting a positive awareness report from three additional Ss. The proportions of aware and unaware Ss in Groups H and L are shown in Table 2. The proportions are significantly different (Fisher's exact $p < .001$), with

Insert Table 2 about here

fewer of the Group L Ss reporting awareness.

A more rigorous test of the hypothesis demands that Groups H and L be matched for I-we responsivity. Accordingly, the overall increase in I-we production from the first to the fourth block of trials was determined for each S separately, and Ss from Groups H and L were matched in pairs of Ss having equal I-we increments. By this procedure, 19 pairs were included, for 16 of whom the response change was the same or within one point. The mean increase for the matched high and low intelligence groups was exactly equal. The proportions of aware and unaware Ss in these matched groups are given in

Table 2. Again, these proportions are significantly different (Fisher's exact $p < .001$), with fewer low than high intelligent Ss reporting awareness.

To determine whether learning took place in both aware and unaware Ss, Groups H and L were redistributed into aware (Group A: N=21) and unaware (Group U: N=23) Ss. Groups A and U were then compared for I-we response production with the randomly reinforced control group (C). Figure 2 shows

Insert Figure 2 about here

the mean number of I-we responses in each block of 20 trials, for groups A, U, and C. Group A showed a significant increase in I-we production from the first to the fourth block of trials ($t = 2.52$, $df = 20$, $p < .02$), as did Group U ($t = 2.54$, $df = 22$, $p < .02$), while Group C showed a non-significant decrease ($t = .72$). Both Group A and Group U showed a significantly greater increase in I-we production than did Group C, but did not differ from each other in this respect (A vs. C: $t = 2.85$, $df = 39$, $p < .01$; U vs. C: $t = 289$, $df = 41$, $p < .01$; A vs. U: $t = .22$).

Discussion

High and low intelligent Ss showed similar increases in I-we response production over 80 verbal conditioning trials. Males and females did not differ in responsivity. Significantly more high than low intelligent Ss reported awareness of the response-reinforcement contingency, and there was no difference in degree of learning between the aware and unaware groups, both of whom, however, differed significantly from the randomly reinforced control group. The results thus support the hypothesis that awareness is related to intelligence.

The cognitive (Spielberger-Dulany) approach to verbal conditioning holds that S's awareness of the response-reinforcement contingency is a

necessary condition for learning to occur. This point of view was contradicted in a recent study by Dixon and Oakes (1965), who showed that restricting the opportunity for mediating cognitive activity during learning led to fewer positive awareness reports, but no reduction in learning. The present study might be regarded as similar to that of Dixon and Oakes, in that low intelligent Ss are more restricted in ability for mediating cognitive activity than high intelligent Ss; and the results are also essentially similar.

There is some evidence that the failure of Spielberger and his students to demonstrate learning without awareness in verbal conditioning is confined to studies employing high intelligent Ss. Thus, in Levin's (1961) study using patients, some evidence for learning without awareness was reported. Spielberger, DeNike, and Stein's (1965) unaware patients also increased their I-we response production over 100 verbal conditioning trials. The present results, however, question the view that awareness necessarily accompanies learning even in the high intelligent group. A comparison of the increase in I-we production from the first to the fourth block of trials for the five high intelligent unaware Ss with that of the control group suggests significant learning by these unaware Ss ($t = 1.89$, $df = 23$, $.10 > p > .05$). In the present study, then, there is no evidence that awareness necessarily accompanies learning even for high intelligent Ss. It must be remembered that all the present Ss were run under relatively informal conditions, and that the high intelligent group were not college students. That such differences between the present study and most of the Spielberger studies might be responsible for the differing results has in fact been indirectly suggested by Spielberger himself (1962).

The importance of using exhaustive questioning procedures for awareness

was demonstrated in the present study, although the results would not have been crucially different without them. Of the 17 high intelligent Ss ultimately classified as aware, only one was so classified on the basis of the lengthy informal discussion. Of the four low intelligent aware Ss, two were classified on the basis of the discussion. It might be argued that the unaware learners did, nevertheless, engage in mediating cognitive activity, and that their failure to acknowledge this activity was due to their limited skill at verbalizing it. However, the results of Dixon and Cakes (1965) study cited above make such an explanation unlikely.

References

Ammons, R. B., and Ammons, C. H. The Quick Test: Provisional manual. Psychological Reports, 1962, 11, 111-161. Monograph Supplement, I-VII.

Crowne, D. P., and Strickland, Bonnie R. The conditioning of verbal behavior as a function of the need for social approval. Journal of Abnormal and Social Psychology, 1961, 63, 395-401.

Dixon, P. W., and Oakes, W. F. Effect of intertrial activity on the relationship between awareness and verbal operant conditioning. Journal of Experimental Psychology, 1965, 69, 152-157.

Dulany, D. E. Hypotheses and habits in verbal conditioning. Journal of Abnormal and Social Psychology, 1961, 63, 251-263.

Farber, I. E. The things people say to themselves. American Psychologist, 1963, 18, 185-197.

Krasner, L., and Ullmann, L. D. Variables affecting the report of awareness in verbal conditioning. Journal of Psychology, 1963, 56, 193-202.

Lanyon, R. I. Verbal conditioning and awareness in a sentence construction task. American Journal of Psychology, 1964, 77, 472-475.

Levin, S. M. The effects of awareness on verbal conditioning. Journal of Experimental Psychology, 1961, 61, 67-75.

Lindquist, E. F. Design and Analysis of Experiments in Psychology and Education. Boston: Houghton Mifflin, 1956.

McCullough, K. P. The influence of experimenter status upon verbal conditioning. Unpublished masters thesis, University of Iowa, 1962.

Spielberger, C. D. The role of awareness in verbal conditioning. In C. W. Eriksen (Ed.), Behavior and Awareness--a symposium of research and interpretation. Journal of Personality, 1962, 30, 73-101.

Spielberger, C. D. Descriptive behaviorism versus cognitive theory in verbal operant conditioning. Psychological Review, in press.

Spielberger, C. D., DeNike, L. D., and Stein, L. S. Anxiety and verbal conditioning. Journal of Personality and Social Psychology, 1965, 1, 229-239.

Southwell, E. A. A note on "awareness" in verbal conditioning. Psychological Reports, 1962, 10, 40.

Taffel, C. Anxiety and the conditioning of neurotics. Journal of Abnormal and Social Psychology, 1955, 51, 496-501.

Footnotes

1. This study was supported by grant OE6-10-105 from the U. S. Office of Education and by a grant from the Rutgers Research Council.

2. Since adult norms were used in arriving at IQ scores from QT raw scores, Ss' abilities were slightly underestimated by the reported IQ figures.

3. Two tailed t-tests were used throughout.

Table 1

Analysis of Variance of I-we Response Production for Males and Females of High and Low Intelligence

Source	df	MS	F
Between subjects			
Sex (S)	1	8.64	.18
Intelligence (I)	1	4.14	.09
S x I	1	126.14	2.70
Error (b)	40	46.77	
Within subjects			
Trials (T)	3	69.11	7.84*
T x S	3	2.08	.24
T x I	3	4.13	.47
T x S x I	3	5.43	.61
Error (w)	120	8.81	

*$p < .01$

Table 2

Number of Positive Awareness Reports Among High Intelligent and Low Intelligent Ss

All Ss: N = 44			Ss individually matched on I-we increase: N = 38		
	Aware	Unaware		Aware	Unaware
High intell.	17	5	High intell.	15	4
Low intell.	4	18	Low intell.	2	17
Exact $p < .001$			Exact $p < .001$		

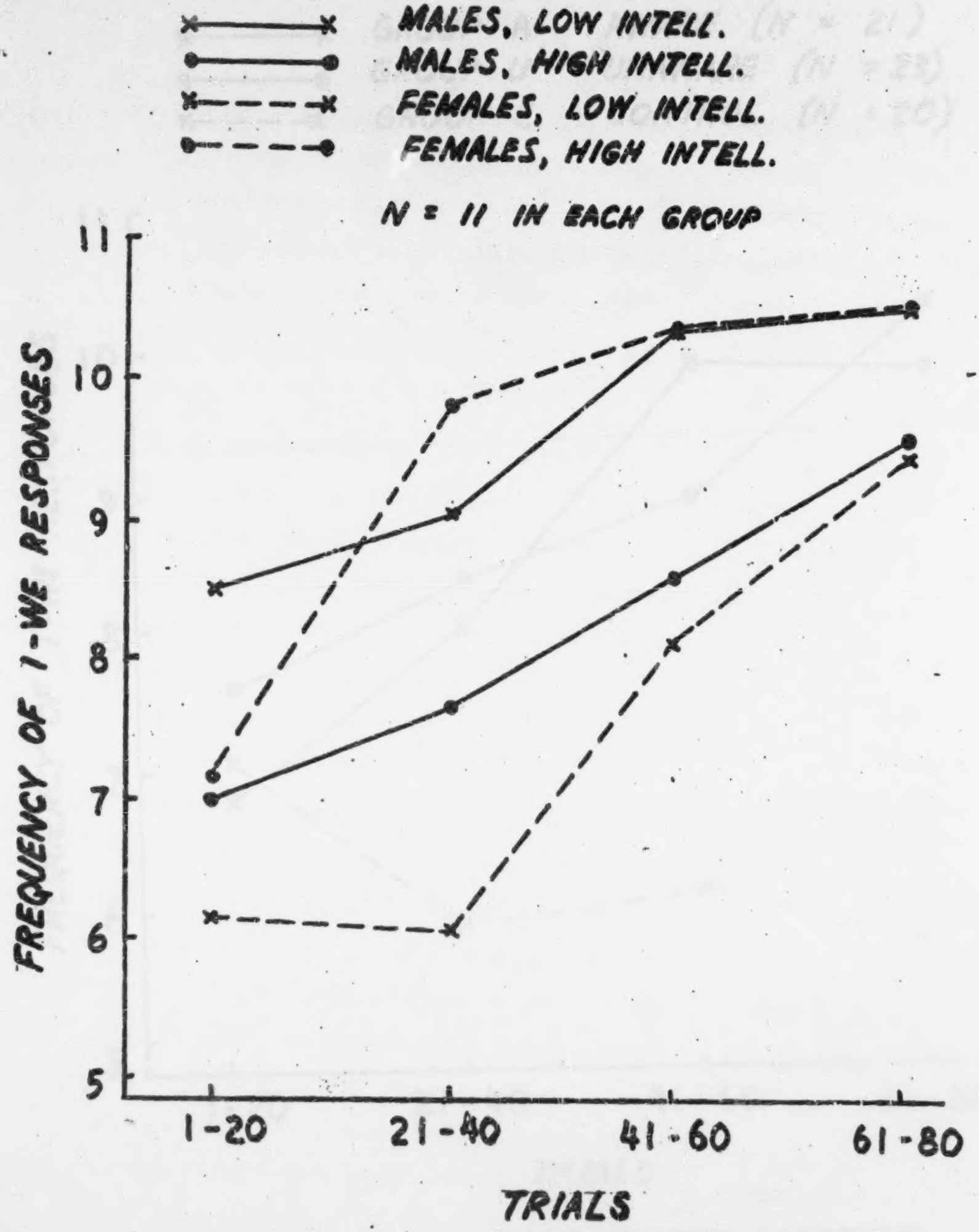

Figure 1. Mean production of I-we responses per block of 20 trials for male and female subjects of high and low intelligence.

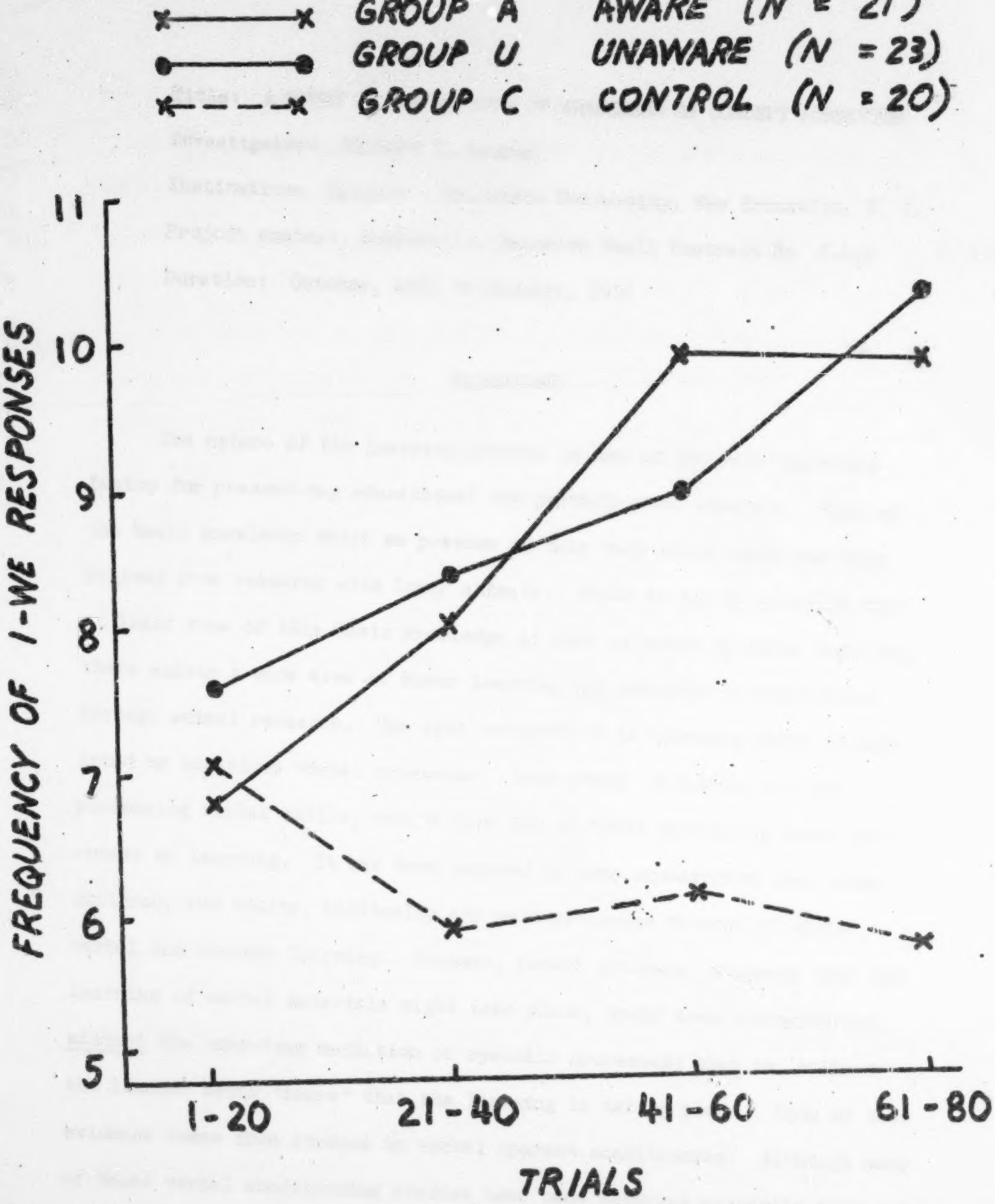

Figure 2. Mean production of 1-we responses per block of 20 trials for aware, unaware, and randomly reinforced control subjects.

This belongs to ED 010 837

Title: A STUDY OF THE EFFECTS OF AWARENESS ON CONCEPT FORMATION

Investigator: Richard I. Lanyon

Institution: Rutgers - The State University, New Brunswick, N. J.

Project number: Cooperative Research Small Contract No. S-439 5-8430

Duration: October, 1965 to January, 1967

BACKGROUND

The nature of the learning process is one of the most important topics for present-day educational and psychological research. Much of the basic knowledge which we possess on this very broad topic has been derived from research with lower animals. While it may be possible that at least some of this basic knowledge is also relevant to human learning, there exists a wide area of human learning not amenable to elucidation through animal research. The area referred to is learning which is mediated by conscious verbal processes. Very young children, not yet possessing verbal skills, cannot make use of these distinctly human processes in learning. It has been assumed by some researchers that older children, and adults, habitually use such processes in most of their verbal and concept learning. However, recent evidence suggests that the learning of verbal materials might take place, under some circumstances, without the conscious mediation of symbolic processes; that is, without the learner being "aware" that the learning is taking place. Some of this evidence comes from studies in verbal operant conditioning. Although many of these verbal conditioning studies have been oriented primarily toward the topic of psychotherapy, they provide opportunities for adding to our know-

ledge of how verbal materials are learned. The present study was designed to clarify some of the conditions under which the learning of verbally conditioned material is accompanied by the use of higher mental processes, and the conditions under which it is not.

OBJECTIVES

The study investigated the effect of two subject variables (intelligence and psychological set) on learning without awareness, and also examined three task variables which were thought to affect ease of learning verbal concepts.

Subject variables:

Hypothesis I. High intelligent Ss, equated for degree of learning on a verbal conditioning task with low intelligent Ss, would report awareness of the response-reinforcement contingency more often than low intelligent Ss, independent of differences in learning.

Hypothesis II. College student Ss who have never taken a psychology course would show more learning without awareness than college students currently involved in a two semester introductory psychology sequence.

Task variables:

Hypothesis III. Response classes defined by simple rules are more readily conceptualized than those defined by complex rules.

Hypothesis IV. Response classes with a small membership are more readily conceptualized than those with a large membership.

Hypothesis V. Response classes defined by complex but reliable rules are more readily conceptualized than those defined by complex and unreliable rules.

PROCEDURE AND RESULTS

Hypothesis I

Twenty-two high intelligent and 22 low intelligent high school juniors and seniors were reinforced for choosing I-we responses in a common verbal conditioning task. Control Ss received the same amount of reinforcement randomly distributed. An exhaustive post-experimental discussion was held with each S to determine any awareness of the response - reinforcement contingency.

Results:

(1) More high than low intelligent Ss reported awareness.

(2) Aware and unaware Ss did not differ in degree of learning, which was significant for both groups.

(3) Degree of learning was unrelated to sex and intelligence.

Hypothesis II

Two studies were performed. In the first, it was predicted that subjects recruited from psychology classes and tested under standard conditions (Group P: psychological set) would show more learning without awareness than non-psychology students recruited and tested under non-psychological conditions (Group N: no set). In the second study a simpler task was employed, and in addition, possible E bias was controlled by leading the student E to expect opposite results from those actually anticipated by his supervisor. A randomly reinforced control group was also included.

Results:

Study I: The set and no-set groups did not differ significantly, possibly because the conditioning task employed was too

difficult.

Study II: Learning without awareness was demonstrated in the no-set subjects.

Hypotheses III, IV, and V were investigated in a single study. The general method was to have Ss watch as E presented, one at a time, a set of index cards, each containing a single word. A total of four such sets were shown. Subjects were informed that each set of cards contained two different kinds of words (i.e., two response classes). After the presentation Ss were asked to make their best guess as to what were the two kinds of words in each of the four sets. Thus, their ability to form the designed concepts was tested. To ensure that each concept was capable of being recognized, Ss were later informed of it and asked to sort the cards, using the correct concept.

Hypothesis III: Simple vs. complex rules. The concept defined by simple rules was "verb tense: present vs. past." Forty-eight common verbs were selected. Twenty-four were randomly chosen to be presented in the past tense, and the remaining 24 were presented in the present tense (first person form). Lists were matched on length and visual cues. The concept defined by complex rules was "verb hostility: Hostile vs. neutral." From a list of 341 verbs rated on hostility by 30 judges, 24 verbs were selected as hostile and 24 as neutral. The hostile verbs had been rated by all raters as hostile, and the neutral verbs had been rated by all raters as not hostile.

Results:

The verb hostility concept was learned significantly more often than the verb tense concept (69/96 vs. 31/96). Hypothesis III

was therefore not confirmed.

Hypothesis IV: Small vs. large class membership. The concept with a small class membership was "grammatical function: pronouns vs. prepositions." Twenty-four words of each type were selected, matched for length and Thorndike-Lorge frequency. The concept with a large class membership was "verb tense: present vs. past," as described above.

Results:

The grammatical function concept was learned significantly more often than the verb tense concept (88/96 vs. 31/96). Hypothesis IV was thus confirmed.

Hypothesis V: Complex reliable rules vs. complex unreliable rules. The concept defined by complex and reliable rules was "verb hostility: hostile vs. neutral," as described above. The concept defined by complex and unreliable rules was "degree of verb hostility: intensely vs. mildly hostile." From the above mentioned judgments of 341 verbs, 24 verbs were selected as intensely hostile (rated as such by most raters), and 24 as mildly hostile (rated as such by most raters).

Results:

The verb hostility concept was learned significantly more often than the degree of verb hostility concept (69/96 vs. 46/96). Hypothesis V was therefore supported.

CONCLUSIONS

(1) Learning can take place in subjects of average intelligence or below in verbal conditioning without an accompanying awareness on the part of the learner.

(2) Learning without awareness in verbal conditioning can also take place if the subjects do not have a "psychological set."

(3) The utility of cognitive theory in understanding verbal conditioning phenomena is not supported.

(4) Concept formation, or the formation of "awareness" while learning, is related to several aspects of the learning task. Specifically, formation is facilitated if the concept has relatively few instances, and if it is reliably defined.

BIBLIOGRAPHY

There are 21 references listed in the final report.

PUBLICATIONS

Lanyon, R. I., and Drotar, D. Verbal conditioning: intelligence and reported awareness. Journal of experimental research in personality, in press.

Lanyon, R. I. Verbal conditioning: Awareness and subject set. Under editorial review.

APPENDIX III

Verbal conditioning: Awareness and Subject Set

Richard I. Lanyon

Rutgers University

Two studies investigated the effect of Ss' "psychological set" on learning without awareness in verbal conditioning. In the first, it was predicted that subjects recruited from psychology classes and tested under standard conditions (Group P: psychological set) would show more learning without awareness than non-psychology students recruited and tested under non-psychological conditions (Group N: no set). The groups did not differ significantly, possibly because the conditioning task was too difficult. In the second study a simpler task was employed, and in addition, possible E bias was controlled by leading the student E to expect opposite results from those actually anticipated by his supervisor. A randomly reinforced control group was also included. Learning without awareness was unequivocally demonstrated in the "no set" Ss.

Introduction

In a recent survey, it was concluded that learning without awareness has by no means been discounted in verbal conditioning, although circumstances favorable for its occurrence have not been widely explored (Lanyon, 1965). For example, the available evidence suggested major differences between college and non-college subjects in the degree of awareness reported after a verbal conditioning task. Significantly, most of the evidence which has been previously utilized to support the view that learning is mediated by awareness was found to have come from studies employing college students.

Reasoning that intelligence is one important factor differentiating college students from other populations studies, Lanyon and Drotar (1966) compared high and low intelligence high school students on a simple verbal conditioning task. When the high and low intelligence groups were equated for degree of learning, awareness was found to have been reported significantly more often by the high intelligence subjects, even after an exhaustive post-experimental interview.

Beside intelligence, college and non-college subjects used in verbal conditioning studies have differed on another major factor. Their expectations of the situation and their need to understand the proceedings have presumably been quite different. College students, who have typically been "signed up" from introductory psychology classes, are likely to approach a verbal conditioning situation with a strong need to understand the nature of the experiment. They might be considered to possess a set toward "learning about psychology," leading them to engage in cognitive activity and to test hypotheses about the nature of the situation (cf. Dulany, 1961). On the other hand, non-college groups and students with no experience in psychology have less reason for being interested in the underlying purpose of the study, and might therefore be expected to treat the situation in a less

questioning manner. The effect of a psychological set would presumably be enhanced by performing the experiment under "psychological" conditions; that is, in an experimental room in a psychology building, with other psychological apparatus in evidence.

EXPERIMENT I

College students who had never taken a psychology course (Group N: no set) were given a simple verbal conditioning task under non-psychological conditions. They were compared with students who were signed up from the second semester class of a two semester introductory psychology sequence (Group P: psychological set) and who participated under regular laboratory conditions. Groups were equated on intelligence and approximate age. It was predicted that the unaware subjects in Group N would show a greater increase in criterion responses than unaware subjects in Group P.

Method

Task

It has been previously demonstrated (e.g., Spielberger, 1962) that on the common verbal conditioning task in which the pronouns "I" and "we" are reinforced, awareness is reported by the majority of college subjects. To avoid a possible ceiling effect, a somewhat more difficult task was chosen for the present study. Eighty 3" x 5" cards were prepared, each with the pronouns "I", "we", "you", and "they" typed across the bottom in random order, and two verbs--one present tense and one past tense--typed in the middle. Care was taken not to select a preponderance of past tense verbs ending in "..ed," in case this should enable a visual distinction between the past tense and present tense verbs. For the same reason, the pronouns "he" and "she" were not used, since the present tense verbs to follow them end in "..s" (he eats; we eat). In this task, which was modified from Binder and Salop (1961), reinforcement could be given for the choice of either present tense or past tense verbs. Since Binder and Salop found that the operant choice in such a situation was approximately 70 per cent past tense and 30 per cent present tense, present tense verbs were chosen as the class for reinforcement. The verbs were all different, except for several of the past tense verbs which were repeated due to the shortage of suitable verbs whose past tense did not end in "..ed." Past and present tense verbs each appeared first on 40 cards.

Subjects

Fifty-six subjects were tested, 16 of whom were discarded for various reasons given below. Groups N and P ultimately contained 20 subjects each (10 males and 10 females). Intelligence was measured by the Quick Test (QT), an individual test said to measure verbal-perceptual intelligence (Ammons and Ammons, 1962). For Group N, the mean QT score was 115.5 (range 103-135), and the mean age was 19.1 (range 18-20). For Group P, the mean QT score was also 115.5 (range 108-125), and the mean age was 18.5 (range 17-20). Two subjects were discarded from the Group N sample and four from the Group P sample in order to equate the mean QT scores.

Group N consisted of students approached at random in the main university library. The experimenter simply requested that they volunteer 20 minutes to take part in a study.[1] Those who agreed were taken to a quiet corner of the building, where they sat across a table from the experimenter and were administered first the QT and then the verbal conditioning task.

Group P consisted of second semester introductory psychology students who signed up for the experiment to fulfill a course requirement. They were given the QT followed by the verbal conditioning task in an experimental room in the psychology laboratory, by the same experimenter.

Procedure

Subjects were instructed to make up a sentence for each card, beginning with any pronoun and containing either of the two verbs. During the first 20 trials, the experimenter responded with the reinforcing stimulus to the first, seventh, and fourteenth sentences, in order to accustom the subjects to the reinforcement. For trials 21-80, he reinforced every sentence for which a present tense verb was chosen. The experimenter wrote down each sentence, using a clipboard so that the subjects could not see what was being written. The reinforcement used was either "good," "fine," "okay," or "mm-hmm," in random order, given immediately following the sentence. Five potential Group N subjects and five potential Group P subjects were eliminated because they gave too few present tense responses (arbitrarily set at four or fewer) during the first 20 trials.

Awareness interview. Following the 80 trials, the experimenter questioned each subject about his perception of the nature of the experiment. Levin's (1961) interview schedule was used, with the following modification. Levin's first seven questions were condensed into four, while two further questions were added to the end of his schedule. The purpose of these additional questions was to take the inquiry even further than Levin had done, by actually confronting subjects with the "answer" and asking if they had thought of it while they were making up sentences. Thus, it was carefully explained to the subjects that "good" etc. had been said after every choice of a present tense verb; and they were given a final opportunity to claim that they became "aware" during the conditioning period.

Results

Means and comparisons between the first and the fourth blocks of trials (1-20 and 61-80) are given in Table 1. Group N showed a significant increase

- - - - - - - - - - - - - - -
Insert Table 1 about here
- - - - - - - - - - - - - - -

in present tense verb responses from the first to the fourth block of trials ($t = 2.97$, $p < .01$), whereas Group P did not ($t = .23$). The difference between these increases was not significant ($t = 1.27$).

The hypothesis requires that comparisons be made on unaware subjects only. Those subjects reporting awareness (one in Group N and three in Group P) were discarded. In no case was there any ambiguity about classifying subjects as aware or unaware. Means and comparisons between the first and the fourth blocks of trials using unaware subjects only are also presented in Table 1, while the means are depicted graphically in Figure 1. Again, Group N subjects significantly increased their production of present tense verbs (t = 2.65, $p < .02$) while Group P subjects did not (t = .07).

- - - - - - - - - - - - - - -
Insert Figure 1 about here
- - - - - - - - - - - - - - -

The crucial comparison of the study concerns the difference between the increases shown by the two groups. This difference, although in the anticipated direction, failed to reach significance (t = 1.33).

Discussion

The results showed that Group N subjects, who did not have a psychological set, increased their production of criterion responses over the verbal conditioning interval, and that such an increase was also shown by those subjects in the group (19/20) who did not report awareness of the response-reinforcement contingency. However, this increase was not significantly greater than that shown by the unaware subjects in Group P, where a psychological set was present. It should be noted that the obtained increases cannot be unequivocally attributed to conditioning, since no appropriate control group was included for comparison.

A possible reason why the increases were relatively small is that the learning required was excessively difficult. Such an interpretation would also account for the unexpectedly small proportion of aware subjects in Group P.

A more awkward flaw than the task difficulty, however, involves the fact that the experimenter knew in advance what results to expect. It could be argued that the groups were accorded differential treatment which produced the discrepancy in response increases. To counter both limitations, a second experiment was performed.

EXPERIMENT II

In this study, the experimenter was given a deliberate bias against the expected results. The major interest was directed toward demonstrating learning without awareness in subjects who do not have a "psychological set." Since it has been amply demonstrated (cf. Spielberger, 1966) that subjects who do possess a set do not learn without awareness, such a group was not included in this study. However, a randomly reinforced control group was included so that response increases in the experimental groups could be designated as specifically due to learning. The verb-tense task was abandoned in favor of the traditional and less difficult pronoun task. In order to lessen the likelihood of any unaware learning being due to subjects' low intelligence (Lanyon and Drotar, 1966), college students and graduates were employed as subjects.

The experimenter was a premedical student who was enrolled in the author's one-semester introductory psychology course for non-majors, and who had independently volunteered to do a research project for his own interest.[2] The author introduced him to the area of verbal conditioning, explaining carefully that, in spite of early evidence to the contrary, he suspected that learners in verbal conditioning could always be shown to be aware of the response-reinforcement contingency, provided they were questioned closely enough. Thus, the author promoted Levin's (1961) position. The experimenter was instructed to be as natural as possible and to minimize references to psychology.

Method

Subjects were 25 males and 25 females, of whom 32 were students at Rutgers University (Camden campus, where such studies are rarely or never conducted), and 18 were recent college graduates. Their mean age was 20.3 and their mean educational level was 14.8 years. Sixteen subjects (eight males and eight females) were randomly assigned to each of two experimental groups: Group F, to be reinforced for using first person pronouns, and Group T, to be reinforced for using third person pronouns. Sixteen additional subjects comprised the control group (Group C), which was run last for reasons given below. The two remaining subjects were discarded at a later stage in the study.

Subjects were requested to take part in a short research study. The majority acquiesced with no questions; those who asked for more than a minimal amount of advance detail were not used. The experimenter did not explain his background. If pressed, he said he was a pre-medical student. He did not identify the study as psychological, and subsequent questioning showed that only five subjects had regarded it as such. Subsequent questioning also assured that none of the subjects included were currently taking a psychology course, and that only two had ever done so. The nature of the sample (and the experimental conditions, as described below) minimized the possibility of a set toward psychological thinking or problem solving.

Subjects were seated across a table from the experimenter in a room free from distraction. All the college students and some of the graduates were recruited from the College Student Center, and were tested in a small study room in the Center. The remainder were recruited in a number of ways, and were tested in a quiet room in a private home. Taffel's (1955) verbal conditioning task was used, with 80 stimulus cards. Each card contained the pronouns "I," "we," "he," and "they" typed across the bottom in random order, and a different past tense verb typed in the center. Instructions were similar to those for Experiment I. The reinforcing stimulus was either "good," "fine," "okay," or "mm-hmm" given in a flat, unemotional tone immediately after the sentence to be reinforced. In order to appear as natural as possible, the experimenter chose whichever response best fitted the sentence.

During the first 20 trials, the experimenter responded with the reinforcing stimulus to the first, seventh, tenth, fourteenth, and nineteenth sentences in order to accustom subjects to the reinforcement. For trials 21-80, Group F subjects were reinforced for choosing "I" or "we," while Group T subjects were reinforced for choosing "he" or "they." For Group C subjects,

the reinforcing stimulus was delivered randomly, in the same proportion for each block as had been given to the experimental subjects. Group C was run last in order that the amount of (random) reinforcement to be delivered would be known. In all cases, the reinforcement was given immediately following the sentence.

Following the 80 trials, subjects were questioned at length about the experiment, using exactly the same procedure as in Experiment I. Only two subjects verbalized awareness; they were discarded, as previously indicated, leaving sixteen subjects in each group. The above mentioned questions about experience with psychology and perception of the study as a psychological one were also asked at the conclusion of the study.

Results

Means and comparisons between the first and the fourth block of 20 trials are given in Table 2. For the control Group C, both I-we responses and he-they responses were recorded: these are, of course, complementary.

- - - - - - - - - - - - - -
Insert Table 2 about here
- - - - - - - - - - - - - -

The results are shown graphically in Figure 2 (again, the two curves for Group C are complementary).

- - - - - - - - - - - - - -
Insert Figure 2 about here
- - - - - - - - - - - - - -

The change in I-we responses in Group F from the first to the fourth block of trials was compared with the corresponding change in Group C. There was a significantly greater change in Group F than in Group C (t = 2.70, df = 30, $p < .02$); and the increase within Group F was itself also significant (t = 5.91, df = 15, $p < .001$). Thus, reinforcement for I-we responses served to increase the production of these responses.

The change in he-they responses in Group T from the first to the fourth block of trials was compared with the corresponding change in Group C. There was a significantly greater change in Group T than in Group C (t = 2.89, df = 30, $p < .01$); and the increase within Group T was itself also significant (t = 4.14, df = 15, $p < .001$). Thus, reinforcement for he-they responses served to increase the production of these responses.

Two modifying comments are in order. First, the results for Groups F and T are not entirely independent, because the same control group was used in each case. Second, the results for Group T are slightly weakened by the fact that he-they production during the final block of trials was not significantly greater than that of the control group.

Discussion

Experiment II demonstrated that, in the absence of the usual psychological

set surrounding participation in a verbal conditioning study, conditioning occurred without an accompanying report of awareness from the subject. Possible experimenter bias during conditioning or interview was controlled by misinforming the experimenter of the anticipated outcome.

Psychologists favoring a cognitive rather than a behavioral approach to awareness in verbal conditioning might have objected to previous studies reporting learning without awareness on the grounds that the subjects employed were often below average in cognitive ability (e.g., many institutionalized psychiatric patients). It could be argued that since these subjects could not report their cognitive processes adequately, they would not constitute a fair test of a hypothesis based on cognitive theory. Such a criticism was precluded in the present study by the use of college students and graduates. For further assurance of adequate reporting, the experimenter carefully explained to the subjects during the interview what had taken place in the conditioning task, so that there should be no doubt as to what he wanted to know about their conscious verbal processes.

It has previously been demonstrated that subject intelligence is one variable affecting the reporting of awareness in verbal conditioning. The present study has shown that the existence of a "psychological set" is another such variable. No attempt is made here to utilize these findings in understanding the verbal conditioning process; however, it is felt that a careful delineation of all the relevant variables affecting awareness will ultimately lead to such an understanding.

References

Ammons, R. B., and Ammons, C. H. The Quick Test: Provisional manual. Psychological Reports, 1962, 11, 111-161. Monograph Supplement, 1-VII.

Binder, A., and Salop, P. Reinforcement and personality factors in verbal conditioning. Journal of Psychology, 1961, 52, 379-402.

Dulany, D. E. Hypotheses and habits in verbal "operant conditioning." Journal of Abnormal and Social Psychology, 1961, 63, 251-263.

Lanyon, R. I. The importance of awareness reports in verbal conditioning. Unpublished manuscript, 1965.

Lanyon, R. I., and Drotar, D. Verbal conditioning: intelligence and reported awareness. Paper presented to the Eastern Psychological Association, New York, April, 1966.

Levin, S. M. Effects of awareness on verbal conditioning. Journal of Experimental Psychology, 1961, 61, 67-74.

Taffel, C. Anxiety and the conditioning of neurotics. Journal of Abnormal and Social Psychology, 1955, 51, 496-501.

Spielberger, C. D. The role of awareness in verbal conditioning. In C. W. Eriksen (Ed.) Behavior and awareness: a symposium of research and interpretation. Journal of Personality, 1962, 30, 73-101.

Spielberger, C. D., and DeNike, L. D. Descriptive behaviorism versus cognitive theory in verbal operant conditioning. Psychological Review, 1966, 73, 306-326.

Footnotes

1. The help of Dennis Drotar is acknowledged in collecting these data.

2. Thanks are extended to Samuel Tartar for conducting this aspect of the study.

TABLE I

Frequency of Present Tense Verb Responses for Group P (Psychological Set) and Group N (No Set), and Comparisons Within and Between Groups.

	Trials 1-20	Trials 61-80	t	p	Diff. in increases	t	p
Group P (N = 20)	6.50	6.70	.23	-	1.25	1.27	-
Group N (N = 20)	7.35	8.80	2.97	<.01			
Unaware subjects only:							
Group P (N = 17)	6.75	6.71	.07	-	1.34	1.33	-
Group N (N = 19)	7.37	8.67	2.65	<.02			

TABLE 2

Frequency of Criterion Responses and Comparisons Within Groups F and T; and Comparisons of Changes Between These Groups and the Control Group C.

	Trials 1-20	Trials 61-80	t	p	Diff. in increases	t	p
Group F	8.06	11.06	5.91	<.001	2.56	2.70	<.02
Group C (I-we)	10.50	10.94	.53	-			
Group T	8.94	11.37	4.14	<.001	3.00	2.89	<.01
Group C (he-they)	9.50	9.06	.53	-			

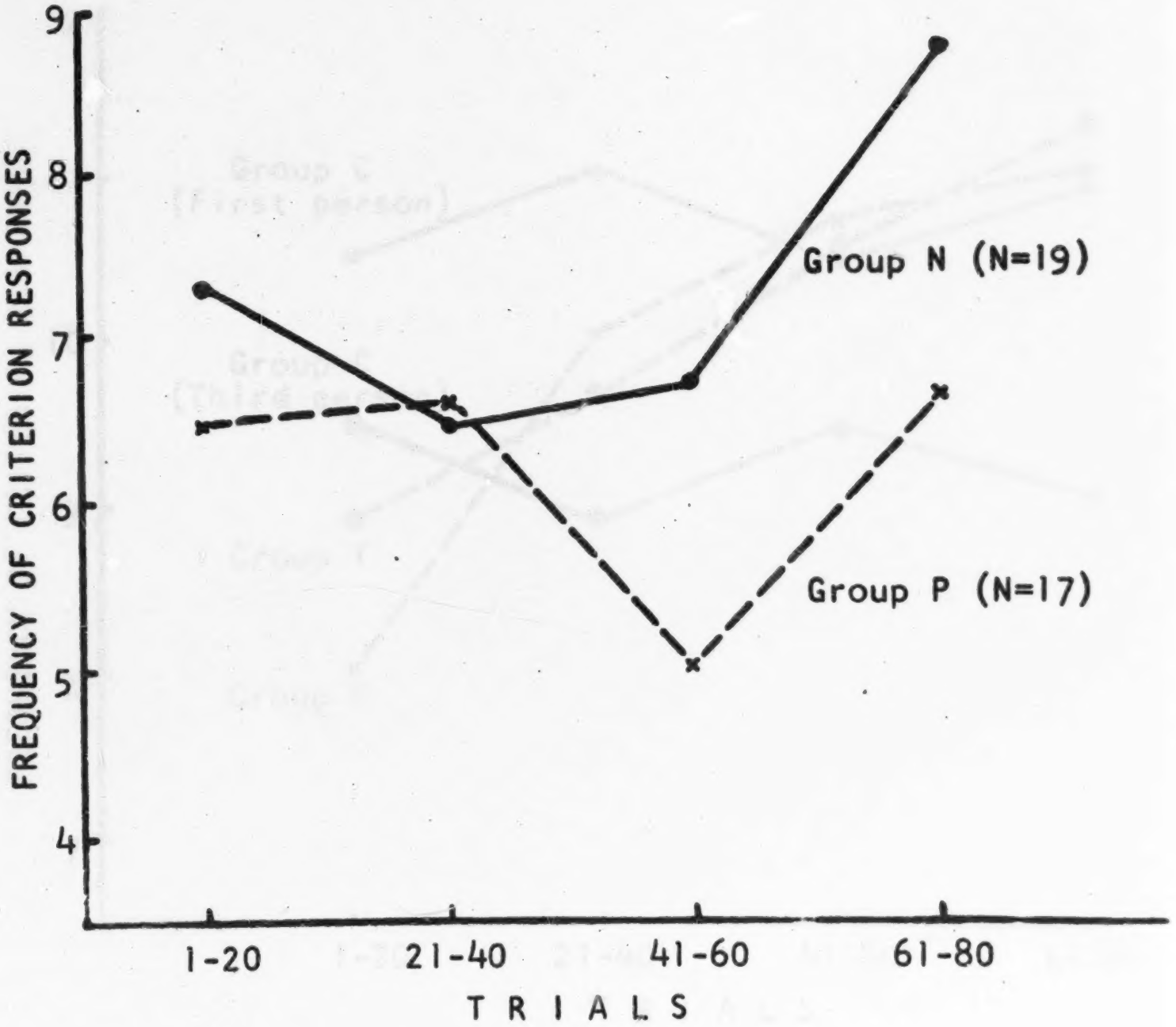

Figure 1. Frequency of present tense verb responses for each block of 20 trials, for unaware subjects only.

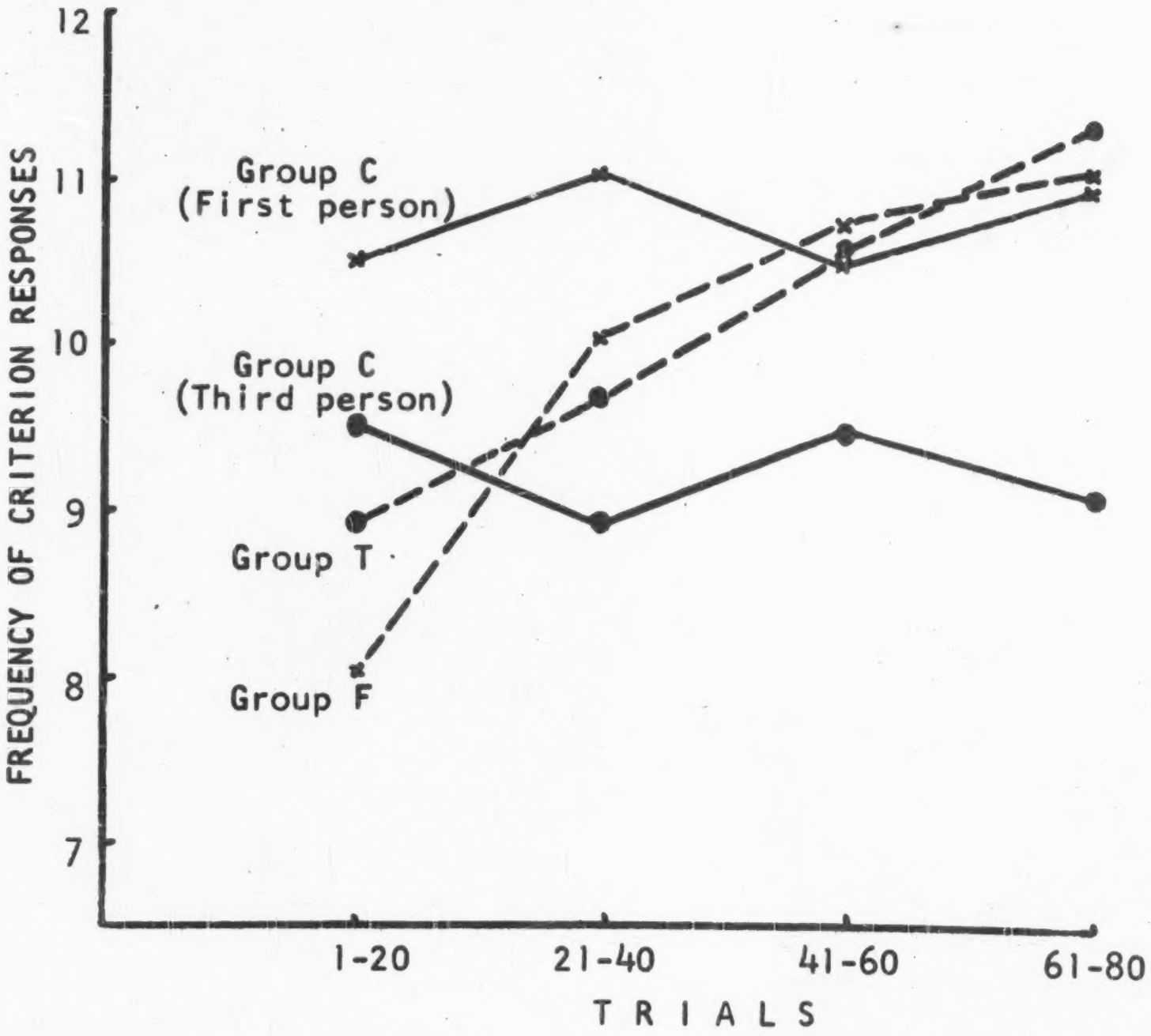

Figure 2. Frequency of criterion responses for each block of 20 trials, for Group F and Group T subjects (all unaware) and for control subjects.